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ABSTRACT

Current Third Generation Partnership Project (3GPP) and Global System for Mobile Communications Association (GSMA) standards require establishing generic slice templates for each Service Provider (SP) worldwide in order to enable Fifth Generation (5G) slicing in Local Break Out (LBO) (roaming) scenarios. In current standards-based deployments, templates have to be shared among all 5G SPs in order to enable 5G roaming. As a result, it can be difficult to create, separate, and maintain various slice templates inside an SP network. Provided herein is a technique to enable 5G slicing for roaming subscribers using predefined slices that can be mapped by an Access and Mobility Management Function (AMF).

DETAILED DESCRIPTION

Current 3GPP and GSMA standards require establishing generic slice templates for each SP worldwide in order to enable 5G slicing in LBO (roaming) scenarios. Since templates have to be shared among all 5G SPs in order to enable 5G roaming, it can be difficult to create, separate, and maintain various slice templates inside an SP network.

This proposal provides a technique to enable 5G slicing for roaming subscribers using predefined slices that can be mapped by an AMF. Consider a process flow for an AMF that may utilize the technique of this proposal for a roaming user equipment (UE), as illustrated in Figure 1, below.

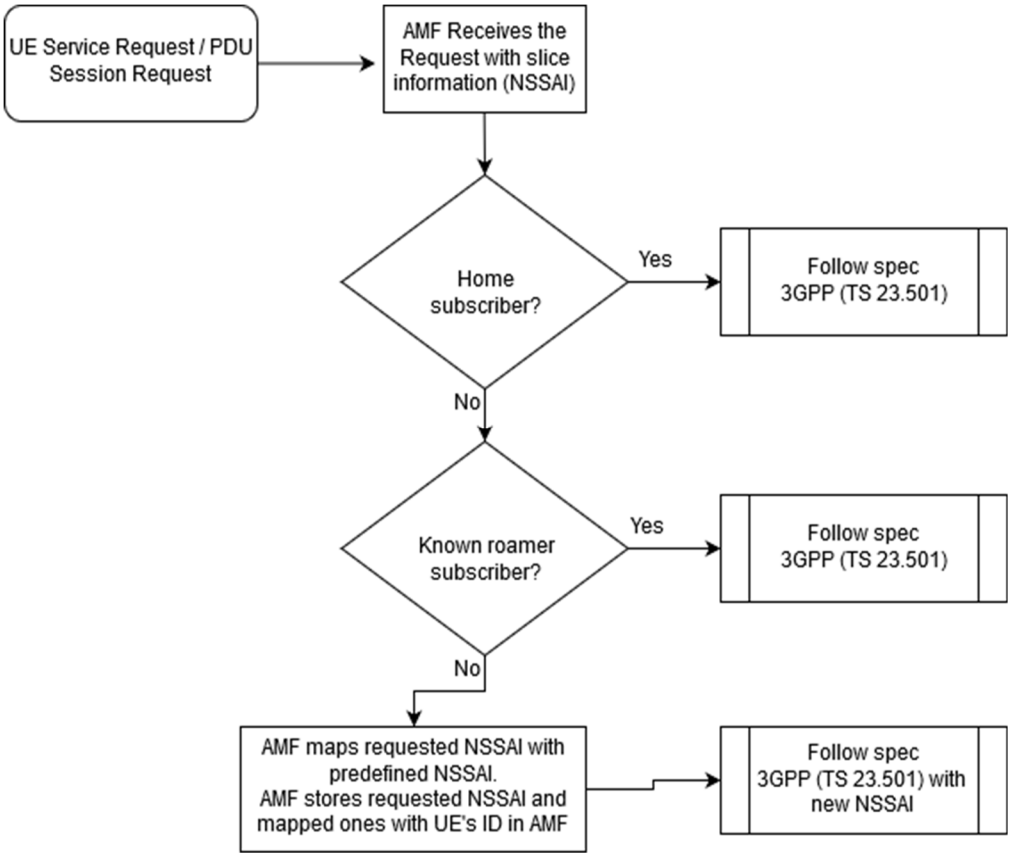

Figure 1: AMF Operations Involving a Roaming UE

For an LBO roaming scenario in accordance with this proposal, when the AMF detects that a UE is not part of its network (e.g., if the Public Land Mobile Network (PLMN) identifier (ID) of the UE does not match the AMF's PLMN ID), the AMF maps a requested slice ID (e.g., Network Slice Selection Assistance Information (NSSAI)) received from the UE based on the AMF's configuration to a predefined slice ID in AMF's network (e.g., a slice ID predefined for the 5G core network in which the AMF resides). The AMF maintains the slice ID requested from the UE within an internal database in which the slice ID is stored in association with the mapped slice ID value determined by the AMF.

For the technique of this proposal, signaling requests between the AMF and the UE contains only the slice ID sent by the UE while the AMF uses its configured mapping values to communicate within the 5G core network (e.g., for communications with a Session Management Function (SMF), Network Slice Selection Function (NSSF), Policy Control Function (PCF), etc.). Thus, the UE's requested slice ID is not

communicated/exposed downstream to the network functions such as the NSSF, SMF, PCF, etc.

Figure 2, below illustrates an example slice mapping in the AMF for a use case in which the UE has requested 3 slices with Slice/Service type (SST) values 1, 2, and 3, and Slice Differentiator (SD) values of 10 and 0.

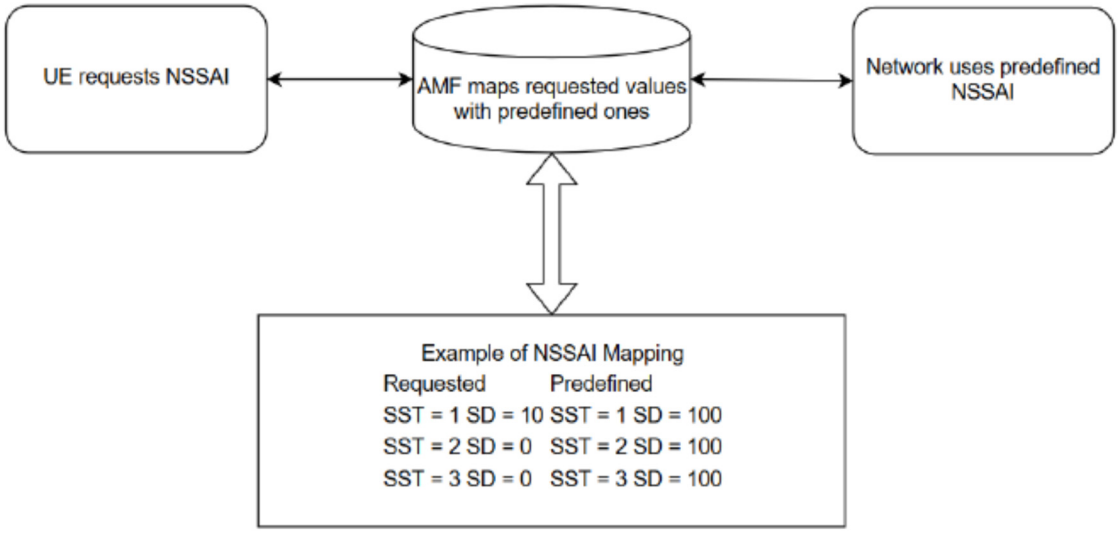

Figure 2: Example AMF Slice Mapping

For the predefined NSSAIs as illustrated in Figure 2, SD 100 may represent a roaming network. During operation, when the AMF communicates slice information to the UE it always uses requested the NSSAI, while communications to network involve the predefined (mapped) NSSAI values. In some implementations, predefined slices (NSSAI) for roaming can be configured based on Slice Type - one for each service defined in 3GPP Technical Specification (TS) 23.501, such as enhanced Mobile Broadband (eMBB), Ultra-Reliable Low-Latency Communication (URLLC), and Mobile Internet of Things (MIoT) corresponding to SST values 1, 2, 3, respectively. However, such a mapping is not mandatory. In some implementations, a mapping can be configured to the same NSSAI.

In contrast with the current 3GPP standard-based solution in which the NSSF and the AMF perform the mapping and the UE stores a new NSSAI, the technique of this proposal significantly simplifies the current process by performing a mapping at the beginning of a UE call flow and not exposing home PLMN (HPLMN) NSSAIs to the UE. The AMF performs the mapping from the UE's NSSAI to the network NSSAI without

further interactions with the NSSF. From the UE perspective, the UE uses the NSSAI slice that it uses for the home network. Thus, in contrast to current standards, the technique of this proposal maps NSSAIs on the AMF side and does not provide NSSAIs from the visited PLMN (VPLMN) to a roaming subscriber.

This technique may provide several benefits, including, but not limited to: facilitating the separation of standard slices from home subscribers and roamers since 3GPP standards define SST values but do not distinguish between home subscribers and roamers; providing additional security by keeping roamer traffic on certain 5G network functions (NFs) and separated from home traffic; and introducing fast roaming for UEs (e.g., the UE "thinks" it uses its home slice type, the network "thinks" it uses standard roamer type, and the AMF "knows" mapping between UE and network slice information). Further, it should be noted that this technique does not change operations as prescribed by GSMA PRD NG.113; rather, the technique simplifies slice mapping operations and provides control of slice mapping exclusively to the AMF.

Further, Generic (Network) Slice Templates can still be used by SPs and can involve any service level agreement (SLA) configurations, as may be desired. The mapping technique of this proposal may allow quick introduction of new 5G roaming partner to an SP network. An SP may still apply specific slices to certain 5G roaming partners, if needed. For example, subscribers belonging to a particular SP and roaming in another network with which the SP has a close relationship may use the particular SP's specific slice definitions. Such a scenario, however, may not be scalable for a wide range of SPs.

Consider another operational example, as shown in Figures 3A and 3B, below, in which Figure 3A illustrates details associated with the current slice selection process per 3GPP standards and Figure 3B illustrates example details in accordance with the technique of this proposal involving slice mapping for roaming subscribers that are performed by the AMF.

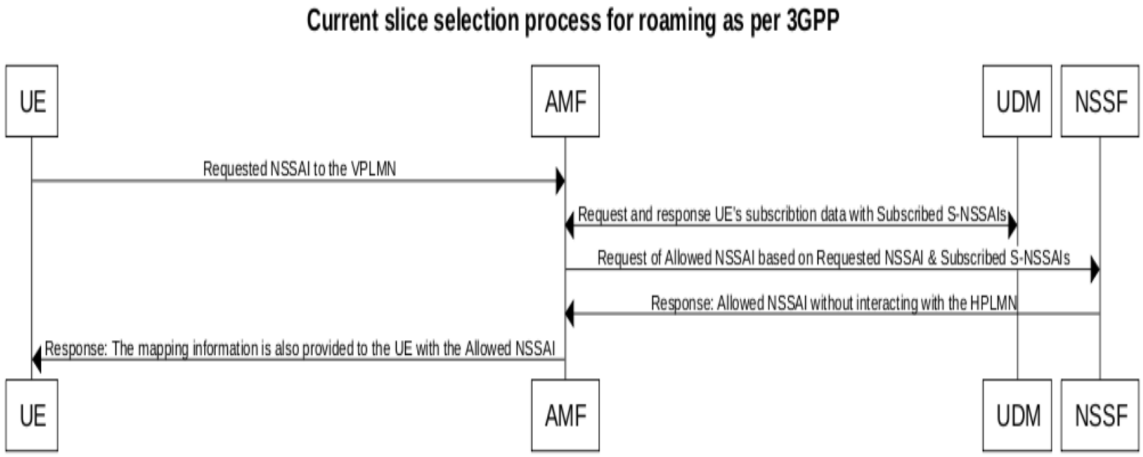

Figure 3A: Current Slice Selection Process

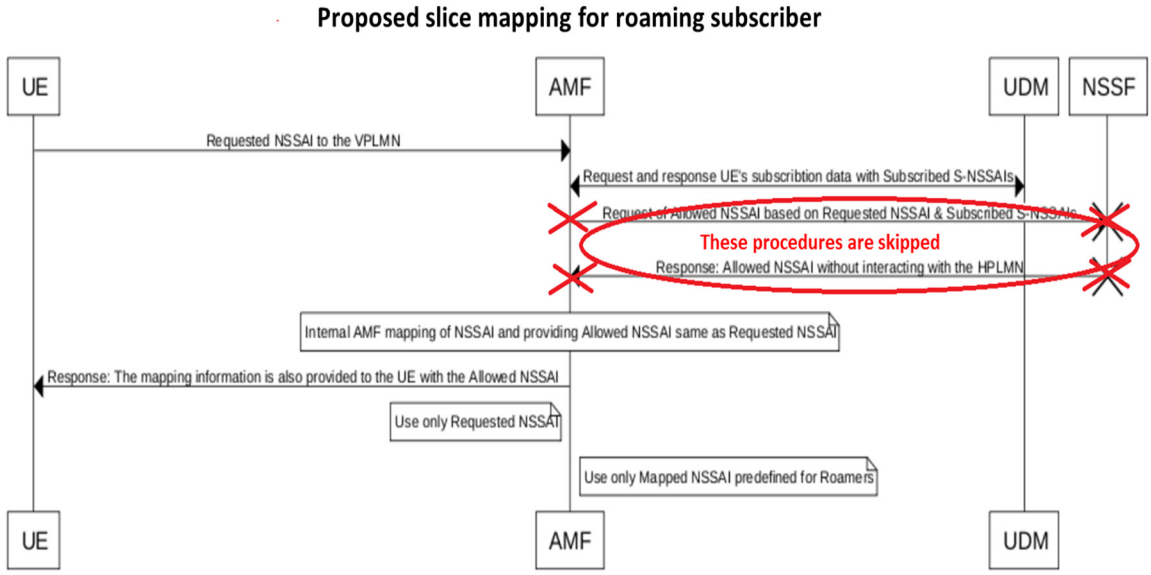

Figure 3B: Proposed Slice Mapping by AMF

For the proposed technique, as illustrated in Figure 3B, the AMF determines that the UE is a home subscriber or roamer based on the UE's Subscription Permanent Identifier (SUPI)/International Mobile Subscriber Identity (IMSI). The requested NSSAI is the slice ID that is requested by UE. In 5G, a slice is provided by the network in response to a UE's

request. The UE's slice subscription is stored in the Unified Data Management (UDM) entity.

In contrast to the operations as shown in Figure 3A involving the current process performed for a roaming subscriber, the technique proposed herein as shown in Figure 3B does do not perform slice selection with the NSSF; rather, the technique of this proposal involves performing NSSAI mapping internally by the AMF (e.g., based on static configuration at the AMF). The slice that the AMF selects is a predefined slice in the AMF's network. From the UE side, the UE does not need to store new slice information and the communication is seamless as though the UE were on its home network. From the visiting network perspective, the UE is handled by predefined slice for roaming. When the UE moves back to the home network (i.e., a non-roaming scenario), the UE will follow the standard flow as prescribed by 3GPP specifications.

In summary, this proposal provides a technique to enable 5G slicing for roaming subscribers using predefined slices that can be mapped on an AMF. The technique allows a quick 5G roaming introduction without using roaming exchanges and complex configurations for each 5G roaming partner. Additionally, a new slice type can be enabled quickly with less changes in an SP network for 5G roamers, which may increase roaming revenue for network operators.